

What is claimed is:

1 1. An orientation division type liquid crystal display
2 device comprising:
3 a pixel electrode substrate including pixel
4 electrodes, active elements, color filters and a first
5 alignment layer covering said pixel electrodes, said active
6 elements and said color filters;
7 an opposing substrate including a common electrode
8 and a second alignment layer covering said common electrode
9 and opposing to said alignment layer of said pixel
10 electrode substrate;
11 a liquid crystal layer disposed between said first
12 and second alignment layers;
13 wiring patterns related to said active elements of
14 said pixel electrode substrate and arranged around said
15 pixel electrodes; and
16 protrusions protruding from a surface of said pixel
17 electrodes toward said common electrode and extending along
18 said wiring patterns to form slopes,
19 said liquid crystal layer being controlled such that,
20 in an initial orientation of said liquid crystal layer,
21 orientation of liquid crystal molecules of said liquid
22 crystal layer is divided to a plurality of orientations by
23 said slopes.

1 2. An orientation division type liquid crystal display

2 device as claimed in claim 1, wherein an underlying layer
3 of said pixel electrodes extend such that an apex portion
4 of said protrusions protrude from said surfaces of said
5 pixel electrodes toward the side of said common electrode
6 and a black matrix layer is formed below said underlying
7 layer to a thickness with which said black matrix layer
8 protrudes from a surface of said color filter corresponding
9 to said pixel electrode.

1 3. An orientation division type liquid crystal display
2 device as claimed in claim 1, wherein an underlying layer
3 of said pixel electrodes extend such that an apex portion
4 of said protrusions protrude from said surfaces of said
5 pixel electrodes toward the side of said common electrode
6 and, below said underlying layer, edge portions of adjacent
7 ones of said color filters are overlapped such that said
8 overlapped edge portions have a thickness with which said
9 overlapped edge portion protrudes from a surface of said
10 color filters.

1 4. An orientation division type liquid crystal display
2 device as claimed in claim 1, wherein a tilting angle θ of
3 said slope represented by

$$\theta = \tan^{-1} (H/L)$$

5 where H is height of said slope and L is length of said
6 slope in a horizontal direction, is 11° or more and a gap
7 ratio (G_1/G_2) of a first cell gap G_1 between said opposing

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well
as
said

8 substrate and the highest portion of said protrusion to a
9 second cell gap G_2 between said opposing substrate and
10 other portions of said surface of said pixel electrode than
11 said protrusion is in a range from 2/10 to 9/10.

1 5. An orientation division type liquid crystal display
2 device as claimed in claim 1, wherein an electrode opening
3 portion is formed in or a slope portion protruding toward
4 said pixel electrode is formed on said common electrode of
5 said opposing substrate.

1 6. An orientation division type liquid crystal display
2 device as claimed in claim 1, wherein said active elements
3 are thin film transistors, respectively, to form an active
4 matrix type liquid crystal display device.

1 7. An orientation division type liquid crystal display
2 device as claimed in claim 1, wherein transparent electrode
3 films forming respective said pixel electrodes are
4 separated from said slopes of said protrusions surrounding
5 said pixel electrodes.

1 8. An orientation division type liquid crystal display
2 device as claimed in claim 1, wherein said first and second
3 alignment layers are vertical alignment layers and liquid
4 crystal molecules of said liquid crystal layer have a
5 negative dielectric anisotropy such that the molecules are

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6 oriented vertically toward said slopes.

1 9. An orientation division type liquid crystal display
2 device as claimed in claim 1, wherein an electrode opening
3 portion is formed in said common electrode of said opposing
4 substrate corresponding to said pixel electrodes.

1 10. An orientation division type liquid crystal display
2 device as claimed in claim 1, wherein a slope portion
3 protruding toward said pixel electrode is formed on said
4 common electrode of said opposing substrate correspondingly
5 to said pixel electrodes.

1 11. A method for fabricating said orientation division
2 type liquid crystal display device claimed in claim 1,
3 comprising the steps of:

4 forming a step portion protruding from a surface of
5 said color filters corresponding to said pixel electrodes
6 toward the side of said common electrode on said wiring
7 patterns;

8 forming said protrusions by covering said color
9 filters and said step portions with a common insulating
10 film; and

11 forming said pixel electrodes on said insulating
12 layer.

1 12. A method as claimed in claim 11, wherein said step

2 portions are formed of the same material as that of said
3 black matrix such that gaps between adjacent color filters
4 are filled thereby.

1 13. A method as claimed in claim 11, wherein said step
2 portions are formed by forming said color filter films such
3 that edge portions of adjacent ones of said color filter
4 films are overlapped.

1 14. A method as claimed in claim 11, wherein transparent
2 electrode films of said pixel electrodes are formed such
3 that said transparent electrode films are not overlapped on
4 said slopes.

1 15. An image display method for an orientation division
2 type liquid crystal display device including an opposing
3 substrate having a common electrode formed thereon, a pixel
4 electrode substrate having pixel electrodes surrounded by
5 protrusions having slopes on the side of said pixel
6 electrodes, respectively, a liquid crystal layer provided
7 between said opposing substrate and said pixel electrode
8 substrate, gate electrodes, a gate wiring, drain electrodes,
9 a drain wiring and a source electrode formed in peripheral
10 portions of said pixel electrodes provided with pixel color
11 layers as color filters, said slopes being formed on step
12 portions formed by a black matrix or overlapped portions of
13 edge portions of adjacent pixel color layers formed on at

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14 least ones of said gate, drain and source electrodes and at
15 least ones of said gate wiring and said drain wiring, said
16 method comprising the steps of:

17 performing an initial orientation control such that
18 liquid crystal molecules on said pixel electrodes between
19 said opposing substrate and said pixel electrode substrate
20 vertically toward said slopes; and

21 orientating liquid crystal molecules further evenly
22 by applying a voltage across said liquid crystal layer when
23 said device is driven to divide the orientation to a
24 plurality of directions to thereby widen a viewing angle of
25 pixel display in a pixel region.